Strip Tillage Effects on Crop Production, Crop Year 2001

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Project Description

The goal of this project is to facilitate strip tillage adoption for row crop production in Iowa. Many Iowa farmers continue to use tillage systems that result in excessive soil and water loss. Nearly 40% of Iowa's cropped land undergoes tillage practices that leave the surface less than 30% covered with residue after planting. These systems tend to be energy intensive, environmentally degrading, and relatively costly. In contrast, nearly 22% of Iowa cropped acreage was no-till planted in 2000, strongly suggesting crop production can be profitable with considerably less tillage than is practiced on many fields. This project uses tillage demonstrations and outreach at high profile locations to show farm managers, agronomists, and public officials that limiting tillage is more profitable than more intense tillage systems and environmentally more advantageous. The demonstrations focused on a relatively new system – strip tillage – that allows in-row soil disturbance while maintaining "no-till" conditions between rows. They target those farmers that believe tillage is necessary on their ground. The goal is to move those farmers from an intensive tillage system to one with increased profitability and considerably better soil and water conservation characteristics.

Strip Tillage

Strip tillage offers a variety of advantages for optimizing crop yield while maintaining soil conditions that promote soil and water conservation. The system allows in-row soil disturbance and subsurface nutrient management for optimum crop production while maintaining no-till conditions between the rows. Subsurface nutrient placement should also reduced nutrient loading of runoff water and favorably affect surface water quality. Strips of "no-till" conditions between each row will reduce runoff and erosion losses compared to more intense tillage systems. Single pass preplanting tillage is less costly than multiple pass options.

Comparing selected soil conditions related to crop production also plays a major role in farmer considerations. Early season soil temperatures show the favorable effect of strip tillage relative to conventional and no-till systems. In-row early season soil temperatures (mid day) for strip tillage were approximately 5ºF warmer at the two-inch depth than for no-till. These temperatures were equal to that observed for conventional tillage. May in-row soil water content was comparable between tillage systems at Atlantic and was about 4% lower for strip tillage in Newton. Warmer drier soil supports earlier planting – advantageous for higher crop yields. This system offers selected advantages common to ridge tillage without the requirement of cultivation for ridge construction.

The characteristics of this system seem well suited to advance soil and water conservation and enhance profitability of the Iowa farmer – a major goal of the Integrated Farm and Livestock Management (IFLM) Demonstration Program. Financially, strip tillage production costs are estimated to be equal to or less than that for more conventional type systems (Table 1 and Mike

Duffy personal communication). Plot and field measures indicate average fall strip tillage corn yields are higher than either conventional tillage or no-till in 2001 at the two different project locations (see Table 1). Marshall silty clay loam soils are found at the Atlantic site, while Humeston silty clay loam soils are found at the Newton site. If strip tillage was adopted on only one million of the approximately six million acres which do not receive conservation tillage, potential cost savings, coupled with favorable yields, and soil and water conservation could conservatively be valued at over $5 - $10 million per year to Iowa farmers. It is very conceivable that greater land area than 1 million acres will be converted to this system making the value of the technology for Iowa several million dollars more that previously suggested. It is important to realize the yields, costs, and dollar attributed to strip tillage are based on limited information from this single-year demonstration. However, the design of this project includes field plots patterned after research trials that have shown similar results. This increases confidence in our statements, and adds credibility to this program.

Table 1. Estimated production costs (Duffy and Smith, 2000) and corn yield for three different tillage treatments at two different Iowa locations. Each yield value is an average of at least eight field plots.

		Grain Yield (Bu/A)	
Tillage	Production Cost ($/A)	Newton, IA	Atlantic, IA
Conventional	$385.78	183	194
No-till	$380.80	182	191
Fall Strip Tillage	$384.46	188	202

Expectations

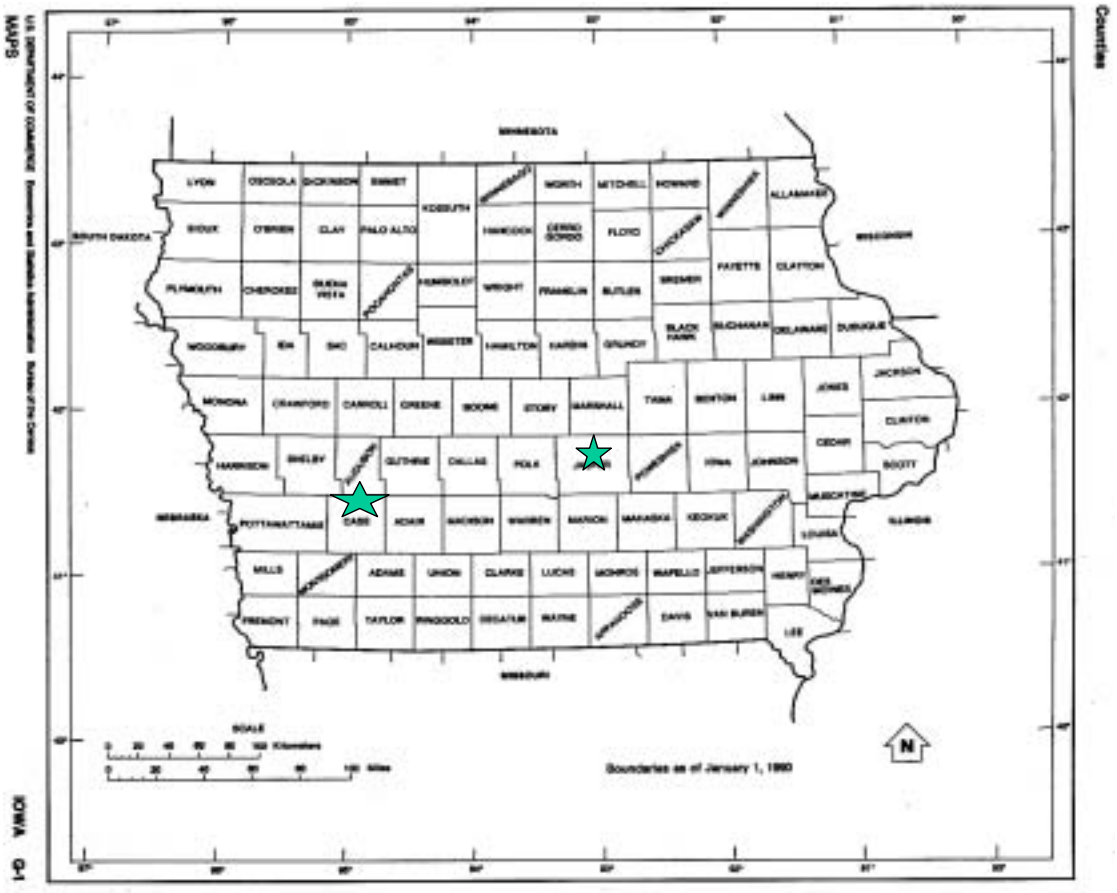
Initial expectations of the project were, and are, to increase adoption of strip tillage and reduce the use of more intensive tillage systems in Iowa. This will require a sustained effort in that farmers rely on results of these demonstrations over a range of growing conditions to make major changes in their farm management. Coverage of demonstrations and measurements will be expended to include soil loss for different tillage systems. To meet the expectations, the project must illustrate the productivity and profitability of the strip system relative to other tillage systems over a range of crop growing conditions. It must also deliver the results to farmers and agronomists than manage Iowa's farmland resource. Continued involvement with Monsanto field days, increased activity with Practical Farmers of Iowa, and information delivery through Iowa State University CCA courses is planned.

It is too early to evaluate whether or not we have met our ultimate expectation – increased adoption of strip tillage. Information gained and the opportunity to communicate with producers, agronomists, and government officials strongly suggests progress is being made.

Demonstration Sites

In the first year, Iowa State University partnered with cooperators having existing strip tillage demonstration areas. These areas were located on Monsanto research and demonstration farms near Newton in Jasper County and Atlantic in Cass County (see Figure 1).

Figure 1. Project Locations for 2001.



★ - Demonstration Sites

Advantages of this arrangement included the following: 1) Field days were planned with a broad range of participants, allowing immediate outreach and training opportunities; 2) Establishment and production costs of demo areas were eliminated - Monsanto covered these costs; 3) There was immediate interaction with management personnel experienced with this production system; and 4) Several existing farmer contacts resulting from Monsanto's strip tillage activity have served as resources for future demonstration and outreach activities on this project. Also, through a consortium program sponsored by Monsanto, additional support ($8,000) was received to enhance demonstration activities and increase cooperation with other partners in other states.

Outreach

Education occurred through field days, CCA short course credits, and tours.

Monsanto Farm, Atlantic Site, 2001.

The largest event was held on July 13 at the Atlantic Monsanto Farm site. Approximately 600 farmers, agronomists, government agency, and politicians attended this event. US Senator Tom Harkin participated in this field day. Participants viewed the different tillage field areas, observed a rainfall simulator, and heard Dr. Peter Hill discuss advantages of the strip tillage system for Iowa.

Rainfall Simulator, Atlantic Site, 2001.

Monsanto also held a "Conservation Boot Camp" in late summer in which participants could earn CCA credits in Soil and Water by participating. Approximately 110 agronomists and consultants attended.

Dr. Peter Hill, Monsanto, Atlantic Site, 2001.

At the Newton site, three Corn States tours visited the site for training in Monsanto technology and viewing the strip till demonstrations. This included approximately 80 agronomists from different parts of the Midwest.

A large part of the participants in these outreach activities were agronomists and consultants that have contacts with many farmers. Opportunity to show farmers the project is important. However, opportunities to work with those that farmers rely on for information, and government officials, is very important. This project stressed this outreach component this year. These individuals are key multipliers of information generated from this project. Outreach will become an increasingly important part of this project as identified in the "Expectations" section of this report.

Additional Partners

Monsanto has been a key partner in this year's project. Dr. Peter Hill with Monsanto has been working with strip tillage and promoting its advantages to the general public, researchers, and extension personnel. We have worked with him to increase this activity and increase information distribution regarding strip tillage. We are communicating with Practical Farmers of Iowa, trying to obtain their involvement for future demonstration and/or outreach activities.

References

Duffy, Mike and Darnell Smith. 2000. Estimated costs of crop production in Iowa – 2001. Iowa State University Extension Bull. FM 1712